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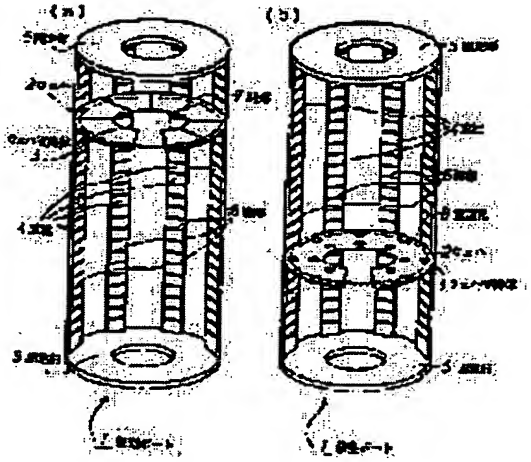
(71)Applicant : SUMITOMO METAL IND LTD
(72)Inventor : MOTOYAMA TAKESHI

(54) WAFER SUPPORT AND VERTICAL BOAT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a wafer support which supports a wafer, from which the wafer can be separated easily when the wafer is moved, and on which the wafer can be placed accurately at a proper position when the wafer is placed on the support and a vertical boat.
SOLUTION: A vertical boat 1 is provided with a plurality of wafer supports 3 on which wafers 2 are placed, a plurality of supports 4 which hold the supports 3 in a state where the placing surfaces of the supports 3 are maintained horizontally, and a fixing section 5 which fixes the supports 4 in erectable states and each wafer support 3 has recesses 7 which can communicate with the outer and inner periphery of the support 3 on at least one surface or a plurality of through holes formed through the support 3. Since a gas is blown upon the contacting part between the wafer 2 and supporting body 3 through the recesses 7 or through holes 8, the wafer 2 does not stick to the support 3 when the wafer 2 is moved nor moves together with a pushed-out gas when the wafer 2 is placed on the support 3.



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CLAIMS

[Claim(s)]
[Claim 1] The wafer base material which is a wafer base material used for a vertical mold boat, and is characterized by forming in the front face of one side at least the crevice of said wafer base material in which outside inner circumference and a free passage are possible.
[Claim 2] The wafer base material which is a wafer base material used for a vertical mold boat, and is characterized by forming two or more through tubes in said wafer base material.
[Claim 3] The vertical mold boat characterized by said wafer base material being a wafer base material according to claim 1 or a wafer base material according to claim 2 in the vertical mold boat which consists of two or more wafers base material which lays a wafer, two or more stanchions which hold these wafers base material horizontally, and a fixed part fixed possible [a set-up of these stanchions].

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the vertical mold boat equipped with the wafer base material with which a wafer base material and a wafer do not stick at the time of the handling before and behind a heat treatment process, and this wafer base material.
[0002]
[Description of the Prior Art] In a semi-conductor manufacture process, heat treatment of diffusion, oxidation, CVD, etc. is performed to a silicon wafer (henceforth a wafer). The wafer has diameter[of macrostomia]-ized to the diameter of 8 inch, or the diameter of 12 inch, and the slip generated in connection with this at the time of heat treatment of a wafer poses a big problem in recent years. This slip is a defect generated to a wafer, and the curvature by the mechanical damage and self-weight, the thermal stress by the temperature gradient, etc. are the causes.
[0003] In order to carry out insertion maintenance of two or more stanchions 51 shown in drawing 8 in order to face heat-treating a wafer and to hold two or more wafers at once, the stationary plate 52 which fixes them, and the wafer, it carries out using the long boat 50 of a vertical mold with the slot 53 formed in the stanchion 51. However, by this long boat 50, in order to support that it is also in a slot 53 about wafer 54 the very thing, the load of the wafer 54 concerning a slot 53 becomes uneven, the load concentrated on the slot 53 of a certain stanchion 51, or the slip was often generated for the curvature by the self-weight of a wafer 54 at the time of heat treatment of a lifting and a wafer 54.
[0004] Then, for example like JP,5-114645,A, JP,6-163440,A, JP,7-45691,A, and JP,7-78777,A, a wafer is widely laid in a field-like base material, this base material is inserted in a slot, and the vertical mold boat which prevented concentration of a load and the curvature of a wafer is known for the former.
[0005]
[Problem(s) to be Solved by the Invention] By the way, when using a base material which was described above, a transfer of a wafer is performed by TSUIZA and the hand made from the ceramics. When transferring a wafer using TSUIZA or a hand, migration of a wafer lifts a wafer upwards, after it makes a base material and a wafer estrange, it is performed by extracting only a wafer, and installation of a wafer moves a wafer to the base material upper part, and is performed by dropping TSUIZA and a hand.
[0006] However, since the conventional base material which was proposed in the above-mentioned official report had become field-like, the following problems had generated it. That is, at the time of migration of a wafer, even if you are going to make it estrange a wafer and a base material as mentioned above, a wafer and a base material stick for contact of the fields of high display flatness, and it does not estrange easily. When it was going to push up the wafer by force, the load of the whole vertical mold boat was applied to TSUIZA or a hand, and there was a problem of damaging this or damaging a wafer by receiving an unnecessary load from TSUIZA or a hand.
[0007] Moreover, when the wafer was laid from the upper part as mentioned above at the time of installation of a wafer, when the gas which exists between a wafer and a base material was extruded, this wafer moved together, and the problem of the problem that it cannot lay in a proper location, neither TSUIZA nor a hand being able to hold a wafer correctly, since the wafer is not further laid in the proper location, and being unable to perform ejection of a wafer had occurred.
[0008] This invention aims at offering the wafer base material and vertical mold boat which can be made in order to solve the above-mentioned trouble, can be made to be able to estrange a wafer easily from a base material at the time of migration of a wafer, and can be correctly laid in a proper location at the time of installation of a wafer.
[0009]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention prepared at least the crevice of the wafer base material which lays a wafer in which outside inner circumference and a free passage are possible on the surface of one side. Moreover, this invention prepared two or more through tubes in the wafer base material which lays a wafer. And a gas circulates between a wafer and a base material by carrying out like this.
[0010]
[Embodiment of the Invention] The wafer base material of this invention is used for a vertical mold boat, and forms in the front face of one side at least the crevice of a wafer base material in which outside inner circumference and a free passage are possible, or forms two or more through tubes in a wafer base material.
[0011] Moreover, in the vertical mold boat which consists of two or more wafers base material which lays a wafer, two or more stanchions which hold these wafers base material horizontally, and a fixed part fixed possible [a set-up of these stanchions], the vertical mold boat of this invention forms in the front face of one side at least the crevice of a wafer base material in which outside inner circumference and a free passage are possible, or forms two or more through tubes in a wafer base material.
[0012] If according to this invention a wafer is lifted by TSUIZA or the hand in case a wafer is moved from a wafer base material, the gas which exists in the periphery section of a wafer base material will be attracted to the contact part of a wafer and a wafer base material, and a gas will circulate to the contact part of a wafer and a wafer base material through two or more crevices or through tubes which were formed in the wafer base material at this time, consequently a wafer will not stick to a wafer base material.
[0013] Moreover, if a wafer is put on a wafer base material from the installation location upper part of a wafer base material in case a wafer is laid in this wafer base material, it will not move with the gas which the gas which exists in the contact part of a wafer and a wafer base material is extruded through two or more crevices or through tubes which were formed in the wafer base material, consequently this wafer extrudes at the time of wafer installation.
[0014] Especially the quality of the material is not specified that what is necessary is just to produce the wafer base material and vertical mold boat of this invention from a quartz, SiC, Si+SiC (Si sinking-in object of SiC), etc. And the wafer base material of this

invention is made into the shape of a ring, and a configuration with [so that the inferior surface of tongue of a wafer and direct contact of TSUIZA and a hand might be possible] an opening, a slit, or notching. Furthermore, a slot is formed in each perpendicular direction homotopic, and two or more stanchions are held, where it inserted the wafer base material here and it is fixed or inserted in it.

[0015] And naturally it needs to be moderately ground from a possibility that a crack may occur being in the wafer itself, if the surface roughness of a wafer base material which prepares a crevice or a through tube is too coarse. And if too deep, since the reinforcement of the wafer base material itself will fall, as for the depth of a crevice, it is desirable to carry out to below one half of the thickness of a wafer base material.
[0016] Moreover, when a gas cannot fully be circulated if the pitch of a crevice is extremely large, and a pitch is extremely small, since the field of a wafer base material becomes equivalent to a coarse condition, 20mm or less of a pitch is good, and it is desirable [a pitch] to be more preferably referred to as 1-5mm.
[0017] Moreover, a crevice forms a crevice in coincidence by being able to form inevitably by forming heights, namely, forming the heights of a pin configuration all over a wafer base material. Since the heights of this pin configuration are the same as that of the pitch of the above-mentioned crevice, 20mm or less has the good path of a pin, and it is desirable to be more preferably referred to as 1-5mm.
[0018] What is necessary is to face forming the heights of the above-mentioned pin configuration, to perform etching processing and just to form by performing sandblasting processing to the wafer base material which stuck the mask on the part which should form [which is a common knowledge technique] heights, and stuck the mask like JP,8-139169,A etc.
[0019] Furthermore, although what is necessary is to face forming two or more through tubes in a wafer base material, and just to open a hole mechanically, when extremely many holes are prepared, it is desirable to prepare a hole with a diameter of 2-10mm from the reinforcement of a wafer base material falling, for example. Naturally, the configuration of a through tube may not be a circle-like. Moreover, what is necessary is just to suppose that 45 degrees is shifted by the inside-and-outside periphery, and it prepares in a radial etc., or you prepare in a radial at intervals of 45 degrees about the pattern.
[0020]
[Example] The example of this invention is explained with reference to drawing 1 - drawing 7 below. Drawing 1 shows the vertical mold boat of this invention. Drawing 2 - drawing 7 show the wafer base material of this invention respectively. The vertical mold boat 1 consists of two or more wafers base material 3 which lays a wafer 2, two or more stanchions 4 which hold these wafers base material 3 horizontally, a fixed part 5 fixed possible [a set-up of these stanchions 4], and a slot 6 formed in each die-length direction homotopic of a stanchion 4 in order to carry out insertion maintenance of the wafer base material 3 to a stanchion 4 in drawing 1 . And the wafer base material 3 forms at least outside inner circumference, the crevice 7 (drawing 1 (a)) which was open for free passage, or two or more through tubes 8 (drawing 1 (b)) on the surface of one side.
[0021] In this invention, as mentioned above, at least, if outside inner circumference, the crevice 7 which was open for free passage, or two or more through tubes 8 are formed, when laying a wafer 2 in the wafer base material 3, the gas between a wafer 2 and the wafer base material 3 escapes from a crevice 7 or a through tube 8 to the wafer base material 3, and it does not move to it on the surface of one side, with the gas which a wafer 2 extrudes. Moreover, when lifting a wafer 2 from the wafer base material 3, it can raise easily, without attracting a gas between a wafer 2 and the wafer base material 3, and sticking from a crevice 7 or a through tube 8. That is, if it is made for a gas to circulate from the exterior between a wafer 2 and the wafer base material 3, specifically, the following wafer base materials 3 can be considered from the above-mentioned operation effectiveness being acquired.
[0022] For example, the configuration of the very thing of the wafer base material 3 is shown in drawing 2 - drawing 7 . Drawing 2 - drawing 6 show the thing in which the crevice 7 was formed to the wafer base material 3, and drawing 7 shows the thing in which the through tube 8 was formed to the wafer base material 3.
[0023] The formation pattern of the crevice in the wafer base material 3 of C mold is shown in drawing 2 . Drawing 2 (a) forms the convex pin 10 of a cross-section configuration as shown in drawing 2 (e) all over the installation side of a wafer 2, and shows what makes parts other than pin 10 the crevice 7. In addition, if the height of a pin 10 gathers, you may make it form a cross-section radii-like pin (projection), although the convex pin 10 is made into the longitudinal-section rectangle from the ability of the pin 10 to which height was easily equal in manufacture with the conventional common knowledge technique to be formed so that it may illustrate.
[0024] Drawing 2 (b) shows the thing in which the crevice 7 of a grid groove which runs the whole installation side surface of a wafer 2 in all directions was formed. Drawing 2 (c) shows what formed the groove crevice 7 in the radial which results from inner circumference to a periphery in the predetermined include-angle pitch. while drawing 2 (d) forms four groove crevices 7 in concentric circular [which changed the path] -- the periphery from inner circumference -- everywhere -- a law -- what formed in the include-angle pitch and formed a crevice 7 and groove crevice 7a which was open for free passage is shown.
[0025] Moreover, about the configuration of the wafer base material 3, what is shown, for example in drawing 3 - drawing 5 may be adopted. That is, drawing 3 shows what is made to carry out insertion maintenance to the slot 6 of a stanchion 4, and uses each of the wafer base materials 3a and 3b of a semicircle arc with predetermined width of face to it. Drawing 4 and drawing 5 insert non-illustrated TSUIZA and a hand from the inferior surface of tongue of a wafer 2, cut and lack only the workspace of lifting this wafer 2, a wafer 2 is held as much as possible in respect of being large, and drawing 4 R> 4 shows what has drawing 5 without that right for what performed beveling processing. In addition, although the example which represented the wafer base material 3 shown in drawing 3 - drawing 5 from drawing 2 as a formation pattern of a crevice on the front face, and formed the pin 10 is shown, it cannot be overemphasized that the formation pattern of a crevice may form other patterns shown in drawing 2 R> 2.
[0026] Drawing 6 shows the ring-like wafer base material 3, and (a) shows, respectively what formed spirally the groove crevice 7 which (b) reaches [from inner circumference] to a periphery in what formed the pin 10 on behalf of the above.
[0027] Moreover, as are shown in the wafer base material 3 as a thing in which the through tube 8 was formed at drawing 7 (a), for example, and a through tube 8 may be formed in a radial in a predetermined include-angle pitch and it is shown in two trains on inner circumference and a periphery at drawing 7 (b), through tube 8a of a periphery may be prepared in a predetermined include-angle pitch, the predetermined include-angle pitch of through tube 8a of a periphery may be shifted, and through tube 8b of inner circumference may be formed.
[0028] Next, a wafer 2 is held actually using the above-mentioned vertical mold boat 1 and the above-mentioned wafer base material 3, and the result when heat-treating a wafer 2 is described.
(Example 1) SiC With Si sinking-in object, the wafer base material 3 as shown in drawing 2 with the outer diameter of 310mm, a bore [of 200mm], and a thickness of 2mm was produced, and the groove crevice 7 with a width of face [of 3mm] and a depth of 0.5mm was formed with the grinding stone in the shape of a grid in 5mm pitch as shown in this wafer base material 3 at drawing 2 (b). And when the 12 inches wafer 2 was laid in the wafer base material 3 of this condition, the wafer 2 did not move but has been correctly laid in the location made into the purpose. And after heat treatment, when taking out a wafer 2, it was able to raise by TSUIZA easily,

without a wafer 2 sticking to the wafer base material 3.
[0029] (Example 2) SiC With Si sinking-in object, the wafer base material 3 as shown in drawing 2 with the outer diameter of 310mm, a bore [of 200mm], and a thickness of 2mm was produced, and the pin 10 with a height [as shown in this wafer base material 3 at drawing 2 (a)] of 0.5mm was formed in 5mm pitch by sandblasting processing. And when the 12 inches wafer 2 was laid in the wafer base material 3 of this condition, the wafer 2 did not move but has been correctly laid in the location made into the purpose. And after heat treatment, when taking out a wafer 2, it was able to raise by TSUIZA easily, without a wafer 2 sticking to the wafer base material 3.
[0030] (Conventional example) SiC With Si sinking-in object, the plate-like wafer base material with the outer diameter of 310mm, a bore [of 200mm], and a thickness of 2mm was produced. And when a 12 inches wafer was laid in the wafer base material of this condition, the wafer moved and was not able to be correctly laid in the location made into the purpose. And after heat treatment, when taking out a wafer, a wafer was not able to stick to a wafer base material and it was not able to raise by TSUIZA easily.
[0031] Thus, this invention is forming a crevice 7, a pin 10, a through tube 8, etc. respectively, and making it a gas circulate from the exterior between a wafer 2 and the wafer base material 3 so that clearly, even if it compares above-mentioned examples 1 and 2 and the above-mentioned conventional example. When a wafer 2 does not stick to the wafer base material 3 when moving a wafer 2, and a wafer 2 is laid to the wafer base material 3 Without a wafer's 2 not moving but fault like the conventional example arising, working efficiency improves and doing damage to a wafer 2, TSUIZA, or a hand is lost.
[0032] in addition, above-mentioned this invention -- or (example 1) (example 2) -- etc. -- the front face of the produced wafer base material -- a CVD method -- SiC For example, you may apply to what was covered about 100 micrometers. Furthermore, a dimension given in the example which described this invention above, the configuration which showed in the drawing are examples, the deformation in the conditions which do not deviate from the meaning is possible for this invention, and when it deforms such, the operation effectiveness equivalent to the above can be acquired.
[0033]
[Effect of the Invention] As mentioned above, since this invention formed in the front face of one side the crevice of a wafer base material in which outside inner circumference and a free passage are possible or formed two or more through tubes in it at least at the wafer base material When a gas circulates to the contact part of a wafer and a wafer base material and a wafer is moved to it from a wafer base material A gas is attracted to the contact part of a wafer and a wafer base material through a crevice or a through tube, and it can raise easily by TSUIZA or the hand, without a wafer sticking to a wafer base material. Moreover, since the gas which exists between a wafer and a wafer base material is promptly discharged through a crevice or a through tube when laying a wafer to a wafer base material, it does not move with the gas which a wafer extrudes in a wafer base material top, and a wafer can be laid in the proper purpose location. Therefore, this invention can suppress member consumption while being able to raise the working efficiency when using the wafer base material which can control reduction of the slip by the self-weight of a wafer.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the vertical mold boat of this invention, and (a) shows the vertical mold boat which adopted the wafer base material in which the crevice was formed, and (b) is the perspective view showing the vertical mold boat which adopted the wafer base material in which the through tube was formed.
[Drawing 2] C mold configuration is shown as a concrete configuration of the wafer base material of this invention, and the wafer base material with which (a) formed the convex pin in the front face, the wafer base material with which (b) formed the crevice in the shape of a grid, the wafer base material with which (c) formed the crevice in the radial, and (d) are the top views showing respectively the wafer base material in which the concentric circular crevice and the crevice of a radial were formed.
[Drawing 3] It is the top view showing the wafer base material which consists of two members of a semicircle arc as a concrete configuration of the wafer base material of this invention.
[Drawing 4] It is the top view showing the wafer base material which cut and lacked only workspaces, such as TSUIZA, as a concrete configuration of the wafer base material of this invention.
[Drawing 5] It is the top view showing the wafer base material which cut and lacked only workspaces, such as TSUIZA, as a concrete configuration of the wafer base material of this invention.
[Drawing 6] A ring-like wafer base material is shown as a concrete configuration of the wafer base material of this invention, and the wafer base material with which the pin was formed in the front face, and (b) of (a) are the top views showing respectively the wafer base material with which the spiral crevice from inner circumference to a periphery was formed.
[Drawing 7] The thing in which the through tube was formed is shown in the wafer base material of C mold configuration as a concrete configuration of the wafer base material of this invention, and the wafer base material with which (a) formed the through tube in the inside-and-outside periphery at the radial, and (b) are the top views showing respectively the wafer base material which the through tube of inner circumference and a periphery was changed and formed the arrangement pitch for it.
[Drawing 8] It is the perspective view showing the vertical mold boat which will be the requisite for the conventional example.
[Description of Notations]
1 Vertical Mold Boat
2 Wafer
3 Wafer Base Material
4 Stanchion
5 Fixed Part
6 Slot
7 Crevice
8 Through Tube

[Translation done.]

* NOTICES *

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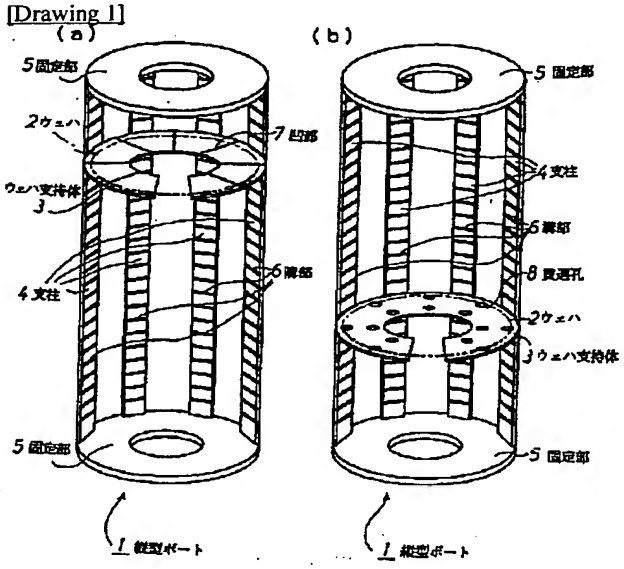
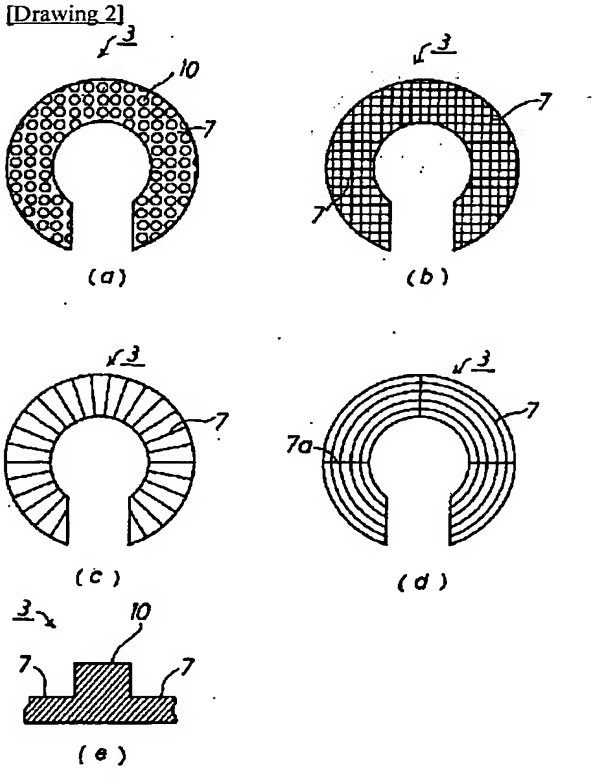
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Drawing 2]



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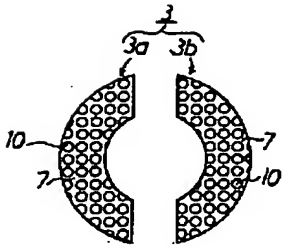

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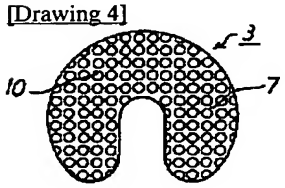

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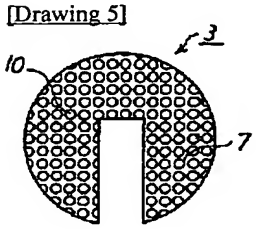

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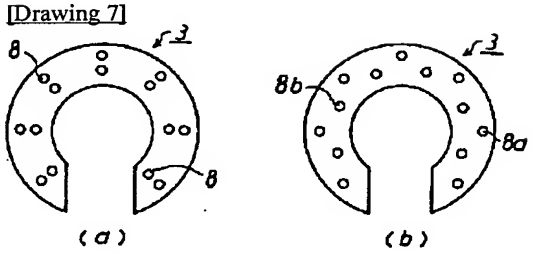
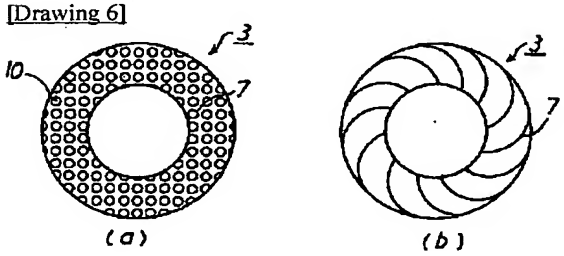
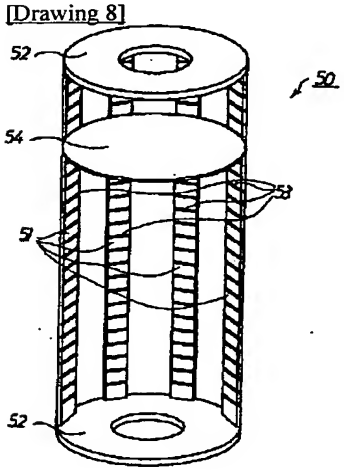


[Drawing 6]



[Drawing 8]



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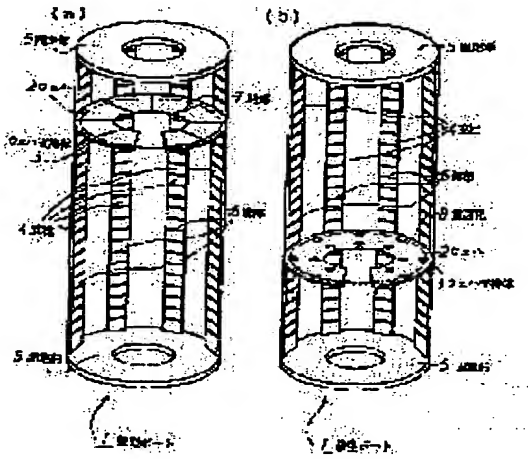

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(71)出願人　000002118
住友金属工業株式会社
大阪府大阪市中央区北浜４丁目５番33号

(72)発明者　元山　剛
大阪府大阪市中央区北浜４丁目５番33号
住友金属工業株式会社内

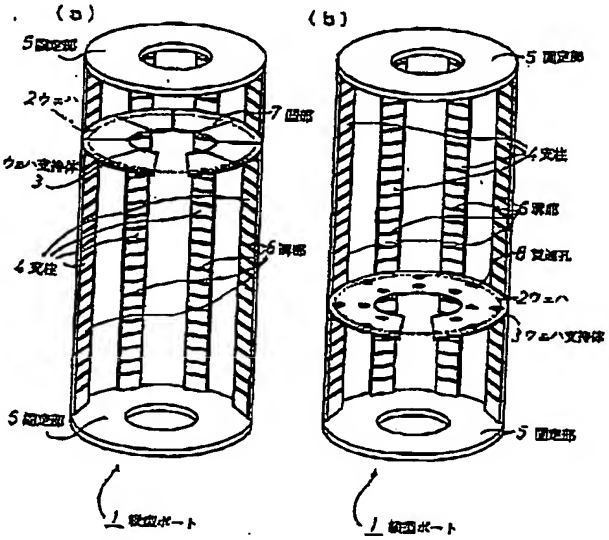
(74)代理人　弁理士　澤上　滴好　（外２名）

(54)【発明の名称】　ウェハ支持体及び縦型ボート

(57)【要約】

【課題】　ウェハとそれを載置する支持体とが、ウェハの移動時には互いを容易に離間し、またウェハの載置時にはウェハを適正位置に正確に載置できるウェハ支持体及び縦型ボートを提供することを目的とする。

【解決手段】　縦型ボート１は、ウェハ２を載置する複数枚のウェハ支持体３と、ウェハ支持体３を載置面に対して水平に保持する複数の支柱４と、支柱４を立設可能に固定する固定部５とを備えており、ウェハ支持体３は、少なくとも片側の表面に外内周と連通可能な凹部７、又は複数個の貫通孔を形成した。この凹部７又は貫通孔８を介してウェハ２とウェハ支持体３との接触部位に気体が流通し、ウェハ２の移動時にはウェハ２とウェハ支持体３とが張りつかず、ウェハ２の載置時にはウェハ２が押し出される気体と共に移動しない。



【特許請求の範囲】
【請求項１】　縦型ボートに使用されるウェハ支持体であって、前記ウェハ支持体の少なくとも片側の表面に外内周と連通可能な凹部を形成したことを特徴とするウェハ支持体。
【請求項２】　縦型ボートに使用されるウェハ支持体であって、前記ウェハ支持体に複数個の貫通孔を形成したことを特徴とするウェハ支持体。
【請求項３】　ウェハを載置する複数枚のウェハ支持体と、これらウェハ支持体を水平に保持する複数の支柱と、これら支柱を立設可能に固定する固定部とからなる縦型ボートにおいて、前記ウェハ支持体が請求項１記載のウェハ支持体、又は請求項２記載のウェハ支持体であることを特徴とする縦型ボート。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、ウェハ支持体とウェハとが熱処理工程前後のハンドリング時に張りつくことがないウェハ支持体及びこのウェハ支持体を備えた縦型ボートに関するものである。
【０００２】
【従来の技術】半導体製造プロセスにおいては、シリコンウェハ（以下、ウェハという）に対して拡散、酸化、ＣＶＤ等の熱処理が行われる。近年ウェハが８インチ径や１２インチ径へと大口径化しており、これに伴ってウェハの熱処理時に発生するスリップが大きな問題となっている。このスリップは、ウェハに発生する欠陥であり、機械的ダメージ、自重による反り、温度差による熱応力等が原因である。
【０００３】ウェハを熱処理するに際しては、一度に複数のウェハを保持するため、図８に示す複数の支柱５１とそれらを固定する固定板５２、及びウェハを挿入保持するために支柱５１に形成した溝部５３を有した縦型のロングボート５０を用いて行う。ところが、このロングボート５０では、ウェハ５４自体を溝部５３でもって支持するために、溝部５３にかかるウェハ５４の荷重が不均一となり、ある支柱５１の溝部５３に荷重が集中したり、ウェハ５４の自重による反りを起こし、ウェハ５４の熱処理時にしばしばスリップを発生させていた。
【０００４】そこで、従来では、例えば特開平５－１１４６４５号、特開平６－１６３４４０号、特開平７－４５６９１号、特開平７－７８７７７号公報などのように、ウェハを面状の支持体に広く載置し、この支持体を溝部に挿入して、荷重の集中やウェハの反りを防ぐようにした縦型ボートが知られている。
【０００５】
【発明が解決しようとする課題】ところで、上記したような支持体を用いる場合、ウェハの移載は、セラミックス製のツイーザやハンドで行われる。ツイーザやハンドを用いてウェハを移載するとき、ウェハの移動は、ウェハを上方へ持ち上げて、支持体とウェハとを離間させてからウェハのみを抜き出して行い、また、ウェハの載置は、ウェハを支持体上方まで移動させてツイーザやハンドを下降させて行う。
【０００６】しかしながら、上記した公報で提案されたような従来の支持体は面状となっていたため、以下の問題が発生していた。すなわち、ウェハの移動時に、上記のようにウェハと支持体とを離間させようとしても、高い平坦度の面同士の接触のためにウェハと支持体が密着して容易に離間しない。無理にウェハを押し上げようとすれば、縦型ボート全体の荷重がツイーザやハンドにかかり、これを破損してしまったり不要な荷重をツイーザやハンドから受けることでウェハを破損してしまうといった問題があった。
【０００７】また、ウェハの載置時，上記のようにウェハを上方から載置すると、ウェハと支持体との間に存在する気体が押し出されるときに一緒に該ウェハが移動し、適正位置に載置できないといった問題、さらにはウェハが適正位置に載置されていないのでツイーザやハンドが正確にウェハを保持できず、ウェハの取り出しができないなどの問題が発生していた。
【０００８】本発明は、上記問題点を解決するためになされたものであり、ウェハの移動時にはウェハを支持体から容易に離間させることができ、またウェハの載置時には適正位置に正確に載置することができるウェハ支持体及び縦型ボートを提供することを目的とする。
【０００９】
【課題を解決するための手段】上記目的を達成するために、本発明は、ウェハを載置するウェハ支持体の少なくとも片側の表面に、外内周と連通可能な凹部を設けたのである。また、本発明は、ウェハを載置するウェハ支持体に複数個の貫通孔を設けたのである。そして、こうすることで、ウェハと支持体との間に気体が流通する。
【００１０】
【発明の実施の形態】本発明のウェハ支持体は、縦型ボートに使用され、ウェハ支持体の少なくとも片側の表面に外内周と連通可能な凹部を形成したものであり、またはウェハ支持体に複数個の貫通孔を形成したものである。
【００１１】また、本発明の縦型ボートは、ウェハを載置する複数枚のウェハ支持体と、これらウェハ支持体を水平に保持する複数の支柱と、これら支柱を立設可能に固定する固定部とからなる縦型ボートにおいて、ウェハ支持体の少なくとも片側の表面に外内周と連通可能な凹部を形成し、又はウェハ支持体に複数個の貫通孔を形成したものである。
【００１２】本発明によれば、ウェハをウェハ支持体から移動する際、ツイーザやハンドによってウェハを持ち上げると、ウェハ支持体の外周部に存在する気体がウェハとウェハ支持体との接触部位に吸引され、このとき、

ウェハ支持体に形成した複数個の凹部又は貫通孔を介してウェハとウェハ支持体との接触部位に気体が流通し、この結果、ウェハはウェハ支持体に張りつくことがない。

【００１３】また、ウェハを該ウェハ支持体に載置する際、ウェハ支持体の載置位置上方からウェハをウェハ支持体に載せると、ウェハとウェハ支持体との接触部位に存在する気体が、ウェハ支持体に形成した複数個の凹部又は貫通孔を介して押し出され、この結果、ウェハ載置時に該ウェハが押し出す気体と共に移動することがない。

【００１４】本発明のウェハ支持体及び縦型ボートは、例えば石英、SiC 、Si+SiC（SiC のSi含浸体）等から作製すればよく、特に材質を規定するものではない。そして、本発明のウェハ支持体は、リング状、又はツイーザやハンドがウェハの下面と直接接触可能なように空隙、スリット、切欠のいずれかを有した形状としている。さらに、複数の支柱は、各々の垂直方向同位置に溝部が形成され、ウェハ支持体をここに挿入し固定し、又は嵌め込んだ状態で保持している。

【００１５】そして、凹部又は貫通孔を設けるウェハ支持体の表面粗さは、粗すぎるとウェハ自体に疵が発生する虞があることから、当然に適度に研磨されている必要がある。そして、凹部の深さは、深すぎるとウェハ支持体自体の強度が低下することから、ウェハ支持体の厚みの半分以下とすることが望ましい。

【００１６】また、凹部は、ピッチが極端に大きいと気体を十分に流通させることができず、また、極端にピッチが小さいと、ウェハ支持体の面が粗い状態と同等になってしまうことから、ピッチは２０mm以下がよく、より好ましくは１～５mmとすることが望ましい。

【００１７】また、凹部は、凸部を形成することで必然的に形成でき、すなわち、ウェハ支持体の全面にピン形状の凸部を形成することにより同時に凹部を形成する。このピン形状の凸部は、上記の凹部のピッチと同様の理由からピンの径が２０mm以下がよく、より好ましくは１～５mmとすることが望ましい。

【００１８】上記ピン形状の凸部を形成するに際しては、周知技術である、例えば、凸部を形成すべき箇所にマスクを貼り付けてエッチング処理を施したり、また、特開平８－１３９１６９号公報のようにマスクを貼り付けたウェハ支持体にサンドブラスト加工を施すなどの方法により形成すればよい。

【００１９】さらに、ウェハ支持体に複数の貫通孔を形成するに際しては、機械的に孔を開ければよいのであるが、極端に多くの孔を設けると、ウェハ支持体の強度が低下することから、例えば、直径２～１０mmの孔を設けることが望ましい。当然、貫通孔の形状は円状でなくてもよい。また、そのパターンに関しては、４５° 間隔で放射状に設ける、あるいは、内外周部で４５° ずらして放射状に設けるなどとすればよい。

【００２０】

【実施例】以下に本発明の実施例について図１～図７を参照して説明する。図１は本発明の縦型ボートを示す。図２～図７は各々本発明のウェハ支持体を示す。図１において、縦型ボート１は、ウェハ２を載置する複数枚のウェハ支持体３と、これらウェハ支持体３を水平に保持する複数の支柱４と、これら支柱４を立設可能に固定する固定部５と、ウェハ支持体３を支柱４に対して挿入保持するために支柱４の各々の長さ方向同位置に形成した溝部６とからなる。そして、ウェハ支持体３は、少なくとも片側の表面に外内周と連通した凹部７（図１（ａ））、又は複数個の貫通孔８（図１（ｂ））を形成している。

【００２１】本発明において、上記のようにウェハ支持体３に、少なくとも片側の表面に外内周と連通した凹部７、又は複数個の貫通孔８を形成すれば、ウェハ支持体３にウェハ２を載置するときは、ウェハ２とウェハ支持体３との間の気体が凹部７、又は貫通孔８から抜けて、ウェハ２が押し出す気体と共に移動することがない。また、ウェハ支持体３からウェハ２を持ち上げるときは、凹部７、又は貫通孔８から気体がウェハ２とウェハ支持体３との間に吸引されて、張りつくことなく容易に持ち上げることができる。つまり、ウェハ２とウェハ支持体３との間に、外部から気体が流通するようにすれば、上記作用効果が得られることから、具体的には、以下のようなウェハ支持体３が考えられる。

【００２２】例えば、ウェハ支持体３のそのものの形状を図２～図７に示す。図２～図６は、ウェハ支持体３に凹部７を形成したものを示し、図７は、ウェハ支持体３に貫通孔８を形成したものを示す。

【００２３】図２に、C型のウェハ支持体３における凹部の形成パターンを示す。図２（ａ）は、ウェハ２の載置面全面に図２（ｅ）に示すような断面形状の凸状のピン１０を形成して、ピン１０以外の箇所を凹部７としているものを示す。なお、凸状のピン１０は、製作において従来の周知技術により容易に高さの揃ったピン１０が形成できることから、図示するように縦断面矩形としているが、ピン１０の高さが揃うならば断面円弧状のピン（突起）を形成するようにしてもよい。

【００２４】図２（ｂ）は、ウェハ２の載置面全面を縦横に走る格子溝状の凹部７を形成したものを示す。図２（ｃ）は、溝状の凹部７を内周から外周へと至る放射状に所定角度ピッチで形成したものを示す。図２（ｄ）は、径を異ならせた同心円状に４本の溝状の凹部７を形成すると共に、内周から外周へと至る所定角度ピッチで形成し、凹部７と連通した溝状の凹部７ａを形成したものを示す。

【００２５】また、ウェハ支持体３の形状については、例えば図３～図５に示すものを採用してもよい。すなわ

ち、図３は、所定幅を有した半円弧状のウェハ支持体３ａ，３ｂの各々を支柱４の溝部６へ挿入保持させて用いるものを示す。図４及び図５は、不図示のツイーザやハンドをウェハ２の下面から挿入し該ウェハ２を持ち上げるといった作業スペースのみを切り欠いて、できるだけウェハ２を広い面で保持するようにしたものであり、図４は面取り加工を施したものを、図５はそうでないものを示す。なお、図３～図５に示すウェハ支持体３は、その表面に凹部の形成パターンとして図２から代表してピン１０を形成した例を示すが、凹部の形成パターンは図２に示した他のパターンなどを形成してもよいことはいうまでもない。

【００２６】図６は、リング状のウェハ支持体３を示し、（ａ）は、上記を代表してピン１０を形成したものを、（ｂ）は、内周から外周へと至る渦状の凹部７を渦巻状に形成したものを、それぞれ示す。

【００２７】また、ウェハ支持体３に貫通孔８を形成したものとしては、例えば図７（ａ）に示すように、内周と外周とで２列に、所定角度ピッチで放射状に貫通孔８を形成してもよく、また、図７（ｂ）に示すように、外周の貫通孔８ａを所定角度ピッチで設け、外周の貫通孔８ａの所定角度ピッチをずらして内周の貫通孔８ｂを形成してもよい。

【００２８】次に、上記した縦型ボート１及びウェハ支持体３を実際に用いてウェハ２を保持し、ウェハ２を熱処理したときの結果を記す。

（実施例１）SiC のSi含浸体で、外径３１０mm、内径２００mm、厚さ２mmの図２に示すようなウェハ支持体３を作製し、このウェハ支持体３に図２（ｂ）に示すような５mmピッチで幅３mm、深さ０．５mmの溝状の凹部７を格子状に砥石で形成した。そしてこの条件のウェハ支持体３に１２インチのウェハ２を載置したとき、ウェハ２は移動せず、目的とする場所に正確に載置できた。そして、熱処理後、ウェハ２を取り出す際には、ウェハ２がウェハ支持体３に張りつくことなく容易にツイーザで持ち上げることができた。

【００２９】（実施例２）SiC のSi含浸体で、外径３１０mm、内径２００mm、厚さ２mmの図２に示すようなウェハ支持体３を作製し、このウェハ支持体３に図２（ａ）に示すような高さ０．５mmのピン１０をサンドブラスト加工にて５mmピッチで形成した。そしてこの条件のウェハ支持体３に１２インチのウェハ２を載置したとき、ウェハ２は移動せず、目的とする場所に正確に載置できた。そして、熱処理後、ウェハ２を取り出す際には、ウェハ２がウェハ支持体３に張りつくことなく容易にツイーザで持ち上げることができた。

【００３０】（従来例）SiC のSi含浸体で、外径３１０mm、内径２００mm、厚さ２mmの平板状のウェハ支持体を作製した。そしてこの条件のウェハ支持体に１２インチのウェハを載置したとき、ウェハは移動し、目的とする場所に正確に載置できなかった。そして、熱処理後、ウェハを取り出す際には、ウェハがウェハ支持体に張りつき、容易にツイーザで持ち上げることができなかった。

【００３１】このように、本発明は、上記の実施例１，２と従来例とを比較しても明らかなように、各々凹部７、ピン１０、貫通孔８などを設けて、ウェハ２とウェハ支持体３の間の外部から気体が流通するようにすることで、ウェハ２を移動させるときに、ウェハ２がウェハ支持体３に張りつくことがなく、また、ウェハ２をウェハ支持体３へ載置したときに、ウェハ２が移動したりせず、従来例のような不具合が生じることなく、作業効率が向上し、ウェハ２やツイーザ又はハンドに損傷を与えることがなくなる。

【００３２】なお、上記した本発明は、（実施例１）又は（実施例２）等で作製したウェハ支持体の表面にＣＶＤ法にてSiC を例えば１００μm程度被覆したものに適用してもよい。さらに、本発明は、上記した実施例に記載の寸法や、図面に示した形状などは、一例であり、本発明は、その趣旨を逸脱しない条件での変形が可能であり、また、そのように変形した際においても、上記と同等の作用効果を得ることができる。

【００３３】

【発明の効果】以上のように、本発明は、ウェハ支持体の少なくとも片側の表面に外内周と連通可能な凹部を形成したり、又はウェハ支持体に複数個の貫通孔を形成したので、ウェハとウェハ支持体との接触部位に気体が流通し、ウェハをウェハ支持体から移動させるときには、凹部又は貫通孔を介してウェハとウェハ支持体との接触部位に気体が吸引され、ウェハがウェハ支持体に張りつくことなくツイーザやハンドによって容易に持ち上げることができる。また、ウェハをウェハ支持体へ載置するときは、ウェハとウェハ支持体との間に存在する気体が、凹部又は貫通孔を介して速やかに排出されるので、ウェハが押し出す気体と共にウェハ支持体上を移動することがなく、ウェハを適正な目的位置に載置できる。従って、本発明は、ウェハの自重によるスリップの低減を抑制することができるウェハ支持体を用いたときの作業効率を向上させることができると共に、部材消耗を抑えることができる。

【図面の簡単な説明】

【図１】本発明の縦型ボートであり、（ａ）は凹部を形成したウェハ支持体を採用した縦型ボートを示し、（ｂ）は貫通孔を形成したウェハ支持体を採用した縦型ボートを示す斜視図である。

【図２】本発明のウェハ支持体の具体的な形状としてＣ型形状を示し、（ａ）はその表面に凸状のピンを形成したウェハ支持体、（ｂ）は格子状に凹部を形成したウェハ支持体、（ｃ）は放射状に凹部を形成したウェハ支持体、（ｄ）は同心円状の凹部と放射状の凹部を形成した

ウェハ支持体、を各々示す平面図である。

【図３】本発明のウェハ支持体の具体的な形状として半円弧状の部材２個からなるウェハ支持体を示す平面図である。

【図４】本発明のウェハ支持体の具体的な形状としてツイーザなどの作業スペースのみを切り欠いたウェハ支持体を示す平面図である。

【図５】本発明のウェハ支持体の具体的な形状としてツイーザなどの作業スペースのみを切り欠いたウェハ支持体を示す平面図である。

【図６】本発明のウェハ支持体の具体的な形状としてリング状のウェハ支持体を示し、（ａ）は表面にピンが形成されたウェハ支持体、（ｂ）は内周から外周に至る渦巻状の凹部が形成されたウェハ支持体を、各々示す平面図である。

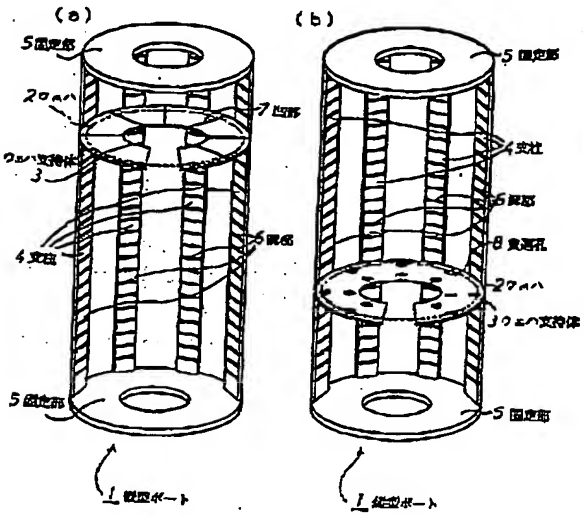
【図７】本発明のウェハ支持体の具体的な形状としてＣ型形状のウェハ支持体に貫通孔を形成したものを示し、（ａ）は内外周に放射状に貫通孔を形成したウェハ支持体、（ｂ）は内周と外周の貫通孔を配置ピッチを異ならせて形成したウェハ支持体、を各々示す平面図である。

【図８】従来例の前提となる縦型ボートを示す斜視図である。

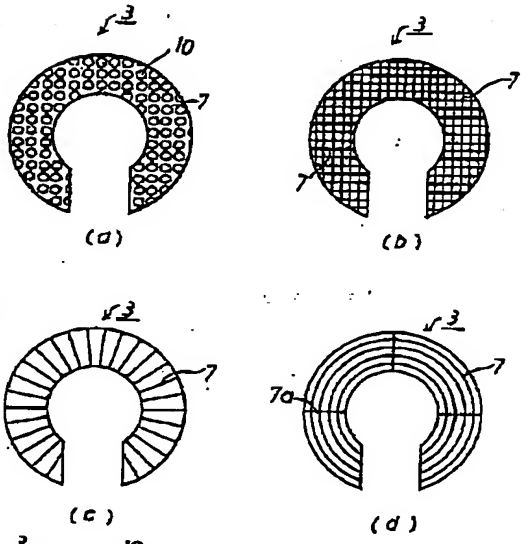
【符号の説明】

1　縦型ボート
2　ウェハ
3　ウェハ支持体
4　支柱
5　固定部
6　溝部
7　凹部
8　貫通孔

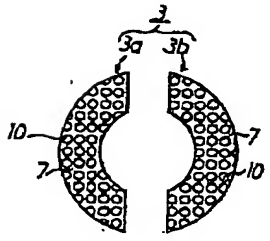
【図１】



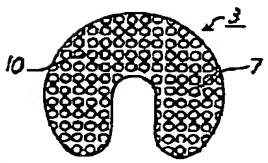
【図２】



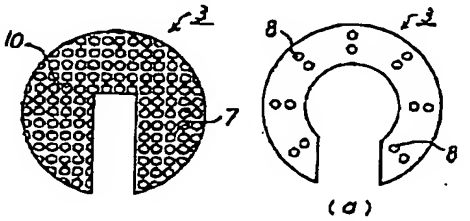
【図３】



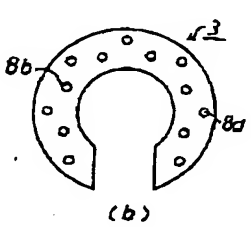
【図４】



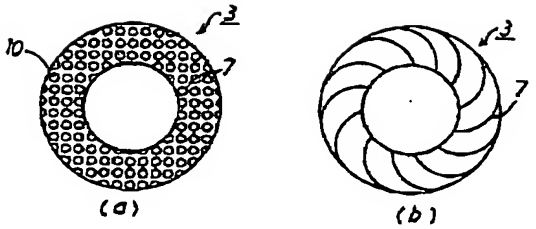
【図５】



【図７】



【図６】



【図８】